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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): An electron beam irradiation apparatus ~~characterized by~~ comprising:

a rotary driving unit for rotationally driving an object to be rotated;

a shield container for rotatably accommodating the object; and

an electron beam irradiation unit provided in said shield container so that the surface of the object is irradiated with electron beams from an irradiation window thereof,

wherein the surface of the object is irradiated with the electron beams during its rotation from said irradiation window of said electron beam irradiation unit.

Claim 2 (original): An electron beam irradiation apparatus according to claim 1, wherein said electron beam irradiation unit emits the electron beams under a low acceleration voltage.

Claim 3 (currently amended): An electron beam irradiation apparatus according to claim 1 or 2, wherein the acceleration voltage of said electron beam irradiation unit is 20 kV through 100 kV.

Claim 4 (currently amended): An electron beam irradiation apparatus according to ~~any one of claims~~ claim 1 through 3, wherein an interior of said shield container is set in an atmosphere of an inert gas, and

said shield container is provided with a gas introduction port and a gas discharge port from which the inert gas flows in the vicinity of said irradiation window.

Claim 5 (original): An electron beam irradiation apparatus according to claim 4, wherein a temperature sensor is provided in the vicinity of said irradiation window, and

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a flow rate of the inert gas is adjusted based on a temperature measured by said temperature sensor.

Claim 6 (currently amended): An electron beam irradiation apparatus according to ~~any one of claims~~ claim 1 through ~~5~~, wherein an oxygen concentration meter for measuring an oxygen concentration within said shield container, is provided.

Claim 7 (currently amended): An electron beam irradiation apparatus according to ~~any one of claims~~ claim 1 through ~~6~~, wherein a vacuumizing device for depressurizing the interior of said shield container is provided.

Claim 8 (currently amended): An electron beam irradiation apparatus according to ~~any one of claims~~ claim 1 through ~~7~~, wherein the object has a disc shape, and
an area extending in at least one radial direction of the surface of the object is irradiated with the electron beams.

Claim 9 (currently amended): An electron beam irradiation apparatus according to ~~any one of claims~~ claim 1 through ~~8~~, wherein the object has a disc shape,

said electron beam irradiation unit includes a plurality of electron beam irradiation tubes,
and

each of said electron beam irradiation tubes irradiates each of a plurality of areas on the surface with the electron beams.

Claim 10 (currently amended): An electron beam irradiation apparatus according to ~~any one of claims~~ claim 1 through ~~8~~, wherein a shutter member is disposed between said irradiation window and the surface of the object, and

a shutter driving mechanism moves said shutter member between an opening position of permitting transmission of the electron beams emitted from said irradiation window and a closing position of blocking the electron beams, thus controlling switchover of the irradiation and non-

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irradiation of the electron beams upon the surface of the object.

Claim 11 (original): An electron beam irradiation apparatus according to claim 10, wherein the switchover is conducted so that a quantity of emission of the electron beams is set large when said shutter member is in the opening position and set small when said shutter member is in the closing position.

Claim 12 (currently amended): An electron beam irradiation apparatus according to any one of claims claim 1 through 11, wherein said shield container is openable and closable and is composed of a metallic material, and has a shielding structure for shielding the electron beams emitted from said irradiation window.

Claim 13 (currently amended): An electron beam irradiation method ~~characterized by~~ comprising the steps of:

rotationally driving an object to be rotated accommodated in a shield container that can be air-tightly closed; and

irradiating the surface of said on-rotating object with the electron beams from an irradiation window of an electron beam irradiation unit.

Claim 14 (original): An electron beam irradiation method according to claim 13, wherein said electron beams irradiation unit emits the electron beams of which an acceleration voltage is 20 kV through 100 kV.

Claim 15 (currently amended): An electron beam irradiation method according to claim 13 or 14, further comprising the steps of depressurizing wherein an interior of said shield container is depressurized and is thereafter replaced with replacing in the interior an inert gas atmosphere by introducing an inert gas.

Claim 16 (currently amended): An electron beam irradiation method according to claim 15,

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irradiation and non-irradiation of the electron beams upon the surface of the object.

Claim 22 (original): An electron beam irradiation method according to claim 21, wherein the switchover is conducted so that a quantity of emission of the electron beams is set large when said shutter member is in the opening position and set small when said shutter member is in the closing position.

Claim 23 (currently amended): An electron beam irradiation apparatus characterized by comprising:

a rotary driving unit for rotationally driving an object to be rotated;

a shield container for rotatably accommodating the object;

an electron beam irradiation unit provided in said shield container so that the surface of the object is irradiated with electron beams from an irradiation window thereof;

a shutter member disposed between said irradiation window and the surface of the object and movable between an opening position of permitting transmission of the electron beams emitted from said irradiation window and a closing position of blocking the electron beams; and

a shutter driving mechanism for moving said shutter member so as to effect switchover to the irradiation and non-irradiation of the electron beams during a rotation of the object.

wherein the object has a disc shape, and an area, extending in a radial direction, on the surface is irradiated with the electron beams from said irradiation window.

Claim 24 (original): An electron beam irradiation apparatus according to claim 23, wherein said electron beam irradiation unit includes a plurality of electron beam irradiation tubes disposed in the radial direction on the surface.

Claim 25 (original): An electron beam irradiation apparatus according to claim 24, wherein said plurality of electron beam irradiation tubes are so arranged as to substantially uniformize a distribution of irradiation beam intensities of the electron beams in the radial direction.

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Claim 26 (original): An electron beam irradiation apparatus according to claim 25, wherein a period of electron beam irradiation time is controlled corresponding to a radial position of the object so as to substantially equalize an integrated irradiation dose of the electron beam irradiation in the radial direction.

Claim 27 (currently amended): An electron beam irradiation apparatus according to claim 25 ~~or 26~~, wherein said shutter member is constructed to start, when opened, opening in an outer peripheral position and to gradually open toward an inner peripheral position on the surface of the object.

Claim 28 (currently amended): An electron beam irradiation apparatus according to ~~any one of claims claim 25 through 27~~, wherein an aperture is formed extending in the radial direction,

the switchover to the irradiation and the non-irradiation of the electron beams is performed by opening and closing said aperture through a movement of said shutter member, and

the electron beam irradiation time is controlled corresponding to the radial position of the object, depending on a relative position between said shutter member and said aperture and on a moving speed of said shutter member.

Claim 29 (original): An electron beam irradiation apparatus according to claim 24, wherein said plurality of electron beam irradiation tubes are arranged to obtain such a distribution that an irradiation beam intensity of the electron beams is high on the outer peripheral side but low on the inner peripheral side in the radial direction.

Claim 30 (original): An electron beam irradiation apparatus according to claim 29, wherein said shutter member is constructed to open and close at a comparatively higher speed than a rotating speed of the object.

Claim 31 (currently amended): An electron beam irradiation apparatus according to ~~any one of claims claim 4 through 27, 29 and 30~~, wherein an aperture is formed extending in the radial

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of claims claim 32 through 35, wherein the object has a disc shape, and further comprising the step of irradiating with the electron beams from said irradiation window an area, extending in a radial direction, on the surface-is-irradiated-with-the-electron-beams-from-said-irradiation-window.

Claim 37 (original): An electron beam irradiation method according to claim 36, wherein the irradiation of the electron beams is effected by a plurality of electron beam irradiation tubes, serving as said electron beam irradiation unit, arranged in the radial direction of the surface.

Claim 38 (currently amended): An electron beam irradiation method according to claim 37, wherein further comprising the steps of arranging said plurality of electron beam irradiation tubes ~~are so arranged as~~ to substantially uniformize a distribution of irradiation beam intensities of the electron beams in the radial direction, and

controlling a period of electron beam irradiation time is controlled corresponding to a radial position of the object so as to substantially uniformize a distribution of an integrated irradiation dose of the electron beam irradiation in the radial direction.

Claim 39 (original): An electron beam irradiation method according to claim 38, wherein said shutter member starts opening in an outer peripheral position and gradually opens toward an inner peripheral position on the surface of the object, thereby controlling the electron beam irradiation time.

Claim 40 (currently amended): An electron beam irradiation method according to claim 37, wherein further comprising the step of arranging said plurality of electron beam irradiation tubes ~~are~~ arranged to obtain such a distribution that an irradiation beam intensity of the electron beams is high on the outer peripheral side but low on the inner peripheral side in the radial direction.

Claim 41 (currently amended): An electron beam irradiation method according to claim 40, wherein further comprising the steps of opening and closing said shutter member is opened and closed at a comparatively higher speed than a rotating speed of the object.

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Claim 42 (currently amended): An apparatus for manufacturing a disc-shaped object, comprising an electron beam irradiation apparatus according to ~~any one of claims claim 1 through 12 and claims 23 through 31,~~

wherein at least one of ~~characterized in that~~ a resin layer and/or a surface layer formed on the object serving as a disc-shaped object is cured by the irradiation of the electron beams.

Claim 43 (currently amended): A method of manufacturing a disc-shaped object, involving the use of ~~an electron beam irradiation apparatus according to any one of claims 1 through 12 and claims 23 through 31, or an electron beam irradiation method according to any one of claims claim 13 through 22 and claims 32 through 41,~~

characterized in that further comprising the steps of forming at least one of a resin layer and/or a surface layer formed on the object serving as a disc-shaped object; and curing the layer is cured by the irradiation of the electron beams.

Claim 44 (original): An apparatus for manufacturing a disc-shaped object, characterized by comprising:

an air-tightly closable chamber including: an electron beam irradiation apparatus having a first rotational unit provided in an openable/closable shield container and accommodating a disc-shaped object, and an electron beam irradiation unit irradiating the surface of the disc-shaped object with electron beams from its irradiation window; and an exchange chamber having a second rotational unit capable of accommodating the disc-shaped object and air-tightly closable and openable/closable independently of said shield container; and

a rotary unit for exchanging said first rotational unit in said shield container and said second rotational unit in said exchange chamber with each other by rotating said first rotational unit and said second rotational unit.

Claim 45 (original): An apparatus for manufacturing a disc-shaped object, characterized by comprising:

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an air-tightly closable chamber including: an electron beam irradiation apparatus having a first rotational unit provided in an openable/closable shield container and accommodating and rotationally driving a disc-shaped object, and an electron beam irradiation unit irradiating the surface of said on-rotating disc-shaped object with electron beams from its irradiation window; and an exchange chamber having a second rotational unit capable of accommodating the disc-shaped object and air-tightly closable and openable/closable independently of said shield container; and

a rotary unit for exchanging said first rotational unit in said shield container and said second rotational unit in said exchange chamber with each other by rotating said first rotational unit and said second rotational unit.

Claim 46 (currently amended): An apparatus for manufacturing a disc-shaped object according to claim 44 or 45, wherein said electron beam irradiation unit emits the electron beams of which an acceleration voltage is 20 kV through 100 kV.

Claim 47 (currently amended): An apparatus for manufacturing a disc-shaped object according to claim 44, ~~45 or 46~~, wherein the surface of the disc-shaped object moving into said shield container by rotating said second rotational unit in said exchange chamber, is irradiated with the electron beams emitted from said electron beam irradiation unit, and said first rotational unit, accommodating the disc-shaped object after being irradiated with the electron beams, in said shield container is rotated and thus transferred into said exchange chamber.

Claim 48 (currently amended): An apparatus for manufacturing a disc-shaped object according to ~~any one of claims~~ claim 44 through 47, wherein said shield container includes a fixed unit forming a first air-tightly closed space in cooperation with said first or second rotational unit and provided with said electron beam irradiation unit.

said exchange chamber includes a third rotational unit forming a second air-tightly closed space in cooperation with said second or first rotational unit and capable of attaching and detaching the disc-shaped object.

in a state where said chamber is air-tightly closed, said first rotational unit moves to and

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from said fixed unit, and said second rotational unit moves to and from said third rotational unit, thereby exchanging the disc-shaped object.

said third rotational unit opens the second air-tightly closed space and rotates while holding the disc-shaped object, thereby ejecting the post-irradiation disc-shaped object, and

a different fourth rotational unit rotates toward said second rotational unit and exchanges the pre-irradiation disc shaped object in a way that supplies the disc-shaped object to said second rotational unit.

Claim 49 (original): An apparatus for manufacturing a disc-shaped object according to claim 48, wherein said electron beam irradiation unit irradiates the electron beams within said first air-tightly closed space during the exchange of the disc-shaped object by said third and fourth rotational units.

Claim 50 (currently amended): An apparatus for manufacturing a disc-shaped object according to ~~any one of claims claim 44 through 49~~, wherein a shutter member disposed between said irradiation window of said electron beam irradiation unit and the surface of the disc-shaped object and is moved by a shutter driving mechanism between an opening position of permitting transmission of the electron beams emitted from said irradiation window and a closing position of blocking the electron beams, thereby controlling switchover to the irradiation and non-irradiation of the electron beams upon the surface of the disc-shaped object.

Claim 51 (currently amended): An apparatus for manufacturing a disc-shaped object according to ~~any one of claims claim 44 through 50~~, wherein an interior of said exchange chamber is depressurized and is thereafter replaced with an inert gas atmosphere.

Claim 52 (currently amended): An apparatus for manufacturing a disc-shaped object according to ~~any one of claims claim 44 through 51~~, wherein the inert gas flows in the vicinity of said irradiation window, thereby cooling off said irradiation window.

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Claim 53 (currently amended): An apparatus for manufacturing a disc-shaped object according to ~~any one of claims claim 44 through 52~~, wherein said shield container is composed of a metallic material, and

a shielding portion for shielding the electron beams is provided at an abutting portion between said first rotational unit and said fixed unit.

Claim 54 (original): A method of manufacturing a disc-shaped object, ~~characterized by comprising the steps of:~~

~~a step of irradiating the surface of a disc-shaped object accommodated in a rotational unit within an air-tightly closed space with electron beams of which an acceleration voltage is 20 kV through 100 kV; and~~

~~a step of opening the air-tightly closed space, rotating said rotational unit and, in linkage with this operation, rotating a different rotational unit accommodating another disc-shaped object, thereby exchanging the post-irradiation disc-shaped object with the pre-irradiation disc-shaped object.~~


Claim 55 (currently amended): A method of manufacturing a disc-shaped object, ~~characterized by comprising the steps of:~~

~~a step of irradiating the surface of an on-rotating disc-shaped object while rotationally driving the disc-shaped object accommodated in a rotational unit within an air-tightly closed space with electron beams of which an acceleration voltage is 20 kV through 100 kV; and~~

~~a step of opening the air-tightly closed space, rotating said rotational unit and, in linkage with this operation, rotating a different rotational unit accommodating another disc-shaped object, thereby exchanging the post-irradiation disc-shaped object with the pre-irradiation disc-shaped object.~~

Claim 56 (currently amended): A method of manufacturing a disc-shaped object according to claim 54 ~~or 55~~, further comprising a step of forming at least one of a resin layer and ~~or~~ a surface layer on the pre-irradiation disc-shaped object,

wherein at least one of the resin layer and ~~or~~ the surface layer is cured by the irradiation of the electron beams.

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Claim 57 (new): An electron beam irradiation apparatus according to claim 13, wherein an aperture is formed extending in the radial direction, and
the switchover to the irradiation and the non-irradiation of the electron beams is performed by opening and closing said aperture through a movement of said shutter member.

Claim 58 (new): An electron beam irradiation apparatus according to claim 23, wherein an aperture is formed extending in the radial direction, and
the switchover to the irradiation and the non-irradiation of the electron beams is performed by opening and closing said aperture through a movement of said shutter member.

Claim 59 (new): An apparatus for manufacturing a disc-shaped object, comprising an electron beam irradiation apparatus according to claim 23,
wherein at least one of a resin layer and a surface layer formed on the object serving as a disc-shaped object is cured by the irradiation of the electron beams.

Claim 60 (new): A method of manufacturing a disc-shaped object, involving the use an electron beam irradiation method according to claim 32,
further comprising the steps of forming at least one of a resin layer and a surface layer on the object serving as a disc-shaped object; and curing by the irradiation of the electron beams.

Claim 61 (new): An apparatus for manufacturing a disc-shaped object according to claim 45, wherein said electron beam irradiation unit emits the electron beams of which an acceleration voltage is 20 kV through 100 kV.

Claim 62 (new): An apparatus for manufacturing a disc-shaped object according to claim 45, wherein the surface of the disc-shaped object moving into said shield container by rotating said second rotational unit in said exchange chamber, is irradiated with the electron beams emitted from said electron beam irradiation unit, and

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inert gas atmosphere.

Claim 66 (new): An apparatus for manufacturing a disc-shaped object according to claim 45, wherein the inert gas flows in the vicinity of said irradiation window, thereby cooling off said irradiation window.

Claim 67 (new): An apparatus for manufacturing a disc-shaped object according to claim 45, wherein said shield container is composed of a metallic material, and

a shielding portion for shielding the electron beams is provided at an abutting portion between said first rotational unit and said fixed unit.

Claim 68 (new): A method of manufacturing a disc-shaped object according to claim 55, further comprising a step of forming at least one of a resin layer and a surface layer on the pre-irradiation disc-shaped object,

wherein at least one of the resin layer and the surface layer is cured by the irradiation of the electron beams.

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